

FEEDING STYLES AND RESPONSIVENESS IN MOTHERS WITH EATING DISORDERS

Elizabeth R. Hoffman

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Approved by:

Advisor: Cynthia M. Bulik

Reader: Margaret E. Bentley

Reader: Robert M. Hamer

Reader: Eric A. Hodges

Reader: Dianne S. Ward

ABSTRACT

ELIZABETH R. HOFFMAN: Feeding Styles and Responsiveness in Mothers with Eating Disorders
(Under the direction of Cynthia M. Bulik)

Eating disorders such as anorexia nervosa and bulimia nervosa represent a significant public health problem for young women in particular, affecting an estimated 2.4% of women of childbearing age in the United States. The children of mothers with eating disorder histories appear to be at especially high-risk for developing eating problems themselves. Yet, little research has investigated how mothers with such histories interact with their young children in the feeding environment. The objective of this project was to provide a comprehensive view of maternal responsiveness in mothers with histories of eating disorders across observational, self-report, and physiologic domains. A case-control pilot study was conducted of 25 mothers with histories of eating disorders with children ages 6-36 months and 25 healthy control mothers matched for child age and child sex. No significant differences were detected between mothers with histories of eating disorders and controls on observed responsiveness to child receptiveness cues during feeding, responsiveness to child fullness cues during feeding or maternal sensitivity during play. Mothers with histories of eating disorders reported less restrictive feeding styles than control mothers ($t(47) = -2.08, p < 0.05$) and scored highest on responsive feeding out of all feeding styles. No significant differences

were detected in child diet composition between mothers with histories of eating disorders and controls, but mothers with histories of eating disorders were more likely to report taking a special approach to feeding involving restriction of certain food types or components, such as limiting processed foods (88% mothers with histories of eating disorders and 60% control mothers; OR= 4.89, 95%CI=1.15-20.79). Lastly, mothers with histories of eating disorders reported greater parenting stress ($t(47)= 2.15, p<0.04$) and displayed a blunted stress response (decreased vagal reactivity) during interactions with their children ($F(1,43)= 7.18, p<0.02$). These findings indicate that greater attention should be given to the influence of stress on parenting in general and the feeding environment specifically for mothers with histories of eating disorders. Future studies of mothers with histories of eating disorders should include larger more diverse samples and should continue to evaluate responsive feeding behavior as children grow older and the feeding environment becomes more complex.

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LIST OF ABBREVIATIONS

AN–anorexia nervosa

ANCOVA–analysis of covariance

ANOVA–analysis of variance

BAI–Beck Anxiety Inventory

BDI-II–Beck Depression Inventory-II

BED–binge eating disorder

BMI–body mass index

BN–bulimia nervosa

ECG–electrocardiogram

EDE-Q–Eating Disorder Examination Questionnaire

EDNOS–eating disorder not otherwise specified

FET–Fisher’s exact test

IBI–inter-beat intervals

IFSQ–Infant Feeding Style Questionnaire

PSI/SF–Parenting Stress Index-Short Form

PSOC–Parenting Sense of Competency Scale

RCFCS–Responsiveness to Child Feeding Cues Scale

RSA–respiratory sinus arrhythmia

SCID-I/P– Structured Clinical Interview for DSM-IV-Patient Edition

CHAPTER I

INTRODUCTION

I.A. Overview

Children of mothers with eating disorders [anorexia nervosa (AN), bulimia nervosa (BN), and some forms of eating disorders not otherwise specified (EDNOS)] represent a high-risk group for eating disorders. Compared with offspring of healthy women, these children tend to weigh less at birth and throughout the first few years of life and have greater risk of early feeding problems and non-organic failure to thrive (Micali, Simonoff, & Treasure, 2009). In childhood they exhibit greater dietary restraint and concern about shape and weight than children of healthy mothers (Woodside & Shekter-Wolfson, 1990). These observations suggest elevated eating disorder risk for these children as they reach adolescence. Eating disorders are clearly complex traits influenced by both genetic and environmental factors (S. Mazzeo, Slof-Op 't Landt, van Furth, & Bulik, 2006). Although we are not yet to the point where we can identify genetic risk, one environmental factor that represents a potential critical avenue for early preventive intervention is the maternal-child feeding environment, yet this realm remains largely unexplored.

Responsiveness during feeding refers to a mother's ability to recognize and respond appropriately to her child's hunger and satiety cues. Decreased

maternal responsiveness and increased control in the early feeding relationship have been associated with increased eating in the absence of hunger, or dysregulated eating, later in childhood (Fisher & Birch, 2002). Mothers with eating disorders may find it difficult to be responsive to their child during feeding due to heightened anxiety at mealtimes, fears about child weight gain, and social cognitive styles influencing their ability to appraise cues (Zucker et al., 2007). Despite the centrality of maternal feeding responsiveness for development of healthy child eating behavior, it remains unstudied in eating disorders. This project seeks to comprehensively describe maternal responsiveness in mothers with histories of eating disorders relative to healthy controls through the combined use of observational, self-report, and physiologic methods.

The following project is a cross-sectional pilot study of 25 mothers with histories of eating disorders with children ages 6-36 months and 25 healthy control mothers. Mothers completed a self-report battery of questionnaires assessing feeding style and child diet, parenting self-efficacy, and parenting stress; maternal responsiveness was assessed by videotaping and behavioral coding of both a free play and typical feeding episode; and physiologic engagement was assessed through measurement of vagal reactivity during both free play and feeding episodes. Specific aims are outlined in the following section.

Results of this investigation have the potential to inform future interventions for mothers with eating disorders by highlighting specific behavioral, psychological, and physiological patterns during feeding that can be targeted to

develop healthier mealtime interactions that may buffer risk for eating disorders in their offspring.

I.B. Specific Aims

Aim 1. Self-Report of Feeding Style and Child Diet, Parental Self-Efficacy, and Parenting Stress. To compare self-report of feeding style and child diet, parenting self-efficacy, and parenting stress in mothers with histories of eating disorders to those mothers with no history.

***Hypothesis 1:** Mothers with histories of eating disorders will report more restrictive feeding styles in terms of diet quantity and quality, lower parenting self-efficacy, and greater parenting stress compared with mothers with no history of eating disorders.*

Aim 2. Observation of Maternal Responsiveness. To determine if mothers with histories of eating disorders display different responsiveness to child cues during a feeding episode that is video-recorded compared to mothers with no history of eating disorders.

***Hypothesis 2:** Mothers with histories of eating disorders will be less responsive to child cues during the feeding episode than mothers with no history of eating disorders, but no differences in responsiveness will emerge between groups during a free play interaction.*

Aim 3. Exploratory Physiologic Response Measurement. To determine the extent to which mothers with histories of eating disorders differ from healthy control mothers in their physiologic response to feeding interactions with their child, in this exploratory aim, we will measure

parasympathetic response using vagal reactivity during a typical feeding episode and free play.

Hypothesis 3: *Mothers with histories of eating disorders will exhibit greater psychophysiological engagement seen as increased vagal withdrawal during a feeding interaction compared with healthy control mothers, but no differences in physiologic responsiveness will emerge between groups during a free play interaction.*

CHAPTER II

LITERATURE REVIEW

II.A. Children of Mothers with Eating Disorders Are an At-Risk Group

An estimated 2.4% of women of childbearing age in the United States have met threshold DSM IV criteria for either AN or BN in their lifetime (Figure 2.1) (Hudson, Hiripi, Pope, & Kessler, 2007). Fertility rates in women with current and past eating disorders appear to be similar to controls, demonstrating that despite prolonged starvation and menstrual irregularities, many women with eating disorders are becoming pregnant (Brinch, Isager, & Tolstrup, 1988; Bulik et al., 1999). An estimated 50-75% of these pregnancies are unplanned, compared to only 19% in women without eating disorders (Bulik et al., 2010; Morgan, Lacey, & Sedgwick, 1999). Whereas some mothers experience remissions from their eating disorder during pregnancy, others continue to be symptomatic (Bulik et al., 2007). In those who remit, symptoms often return with increased severity in the first year postpartum, as mothers struggle to return to pre-pregnancy weight (Lacey & Smith, 1987; Morgan, et al., 1999; Namir, Melman, & Yager, 1986). Therefore, children of mothers with eating disorders may be exposed to disordered eating behaviors at a young age by mothers who are symptomatic.

There is considerable evidence that the development of eating disorders such as AN and BN is influenced by genetic factors (Bulik et al., 2006; Bulik, Sullivan, Wade, & Kendler, 2000; S. Mazzeo, et al., 2006; Slof-Op 't Landt et al., 2005). Environment also plays an important role in their emergence (Striegel-Moore & Bulik, 2007). One pathway by which risk for eating disorders may be increased in offspring of women with eating disorders is via passive gene-environment correlation (Plomin, DeFries, & Loehlin, 1977). This refers to the fact that not only may these children inherit genes that place them at greater risk for developing eating disorders, but they are also exposed to disordered eating attitudes and behaviors in their home environment that may further exacerbate risk (Bulik, Reba, Siega-Riz, & Reichborn-Kjennerud, 2005). An unhealthy eating environment can lead to problems with feeding at a young age, which has been associated with eating disorders later in life (Jacobs & Isaacs, 1986; Marchi & Cohen, 1990). Indeed, infants of mothers with eating disorders are at greater risk for feeding problems and non-organic failure to thrive than infants of mothers without eating disorders (Brinch, et al., 1988; Micali, et al., 2009; Stein & Fairburn, 1989; Whelan & Cooper, 2000). These children also exhibit greater dietary restraint and concern about shape and weight at a young age compared with children of mothers without an eating disorder (Woodside & Shekter-Wolfson, 1990). Thus, the children of mothers with eating disorders represent an at-risk group. Greater understanding of the early maternal-child feeding relationship is needed to identify specific feeding patterns in mothers with eating disorders that may adversely influence the development of healthy eating

patterns in their children and may eventually be targeted in parenting interventions for mothers with eating disorders.

II.B. Feeding Practices and Styles of Mothers with Eating Disorders

As eating is a very stressful task for individuals with eating disorders, it is not surprising that providing food for children is also perceived as stressful. Storing and preparing food for children has been reported as a source of stress by mothers with eating disorders, as they fear that proximity to food could trigger binge eating (Fahy & Treasure, 1989; Russell, Treasure, & Eisler, 1998). Women with eating disorders also exhibit great concern for their children's weight, even when it is within a healthy range (S. E. Mazzeo, Zucker, Gerke, Mitchell, & Bulik, 2005; Russell, et al., 1998), and several studies have found that women with eating disorders have tried to help their normal-weight children lose weight by feeding less regularly or restricting carbohydrates, sweets, or meat (Agras, Hammer, & McNicholas, 1999; Lacey & Smith, 1987; S. E. Mazzeo, et al., 2005). Mothers with eating disorders have also been reported to fear "overeating" by their children despite evidence of malnutrition (Honjo, 1996).

Although most descriptive studies of mothers with eating disorders have included mothers currently meeting all criteria for eating disorder diagnoses, there is evidence that concerns over feeding and difficulties during mealtimes persist for mothers even after clinical recovery from an eating disorder. Mothers with histories of eating disorders describe mealtimes as difficult due to expectations of eating together, fighting, mother's desire to skip the meal, and

stress over food preparation (S. E. Mazzeo, et al., 2005). These mothers also express concern about their children gaining weight or becoming overweight and reported desiring to restrict children's intake (S. E. Mazzeo, et al., 2005). Studies using observational methods in mothers with a lifetime history of an eating disorder have found that mealtimes are marked with conflict (Stein, Woolley, Cooper, & Fairburn, 1994) and decreased positive interactions (Waugh & Bulik, 1999) between mother and child, but no studies have observed maternal responsiveness during feeding in mothers with eating disorders.

There has been much interest in the obesity literature to define feeding-specific parenting styles, as it is thought that certain styles may be associated with childhood obesity. Similar to parenting styles (Constanzo & Woody, 1985), five major feeding styles have been described that reflect a parent's degree of control/demand and responsiveness during feeding (Johnson & Birch, 1994; Thompson et al., 2009). A parent who is demanding during feeding with little responsiveness to child cues is classified as *restrictive* (limiting the type or quantity of food consumed) or *pressuring* (using food to soothe the child or increasing the amount of food the child consumes). These controlling feeding styles have been associated with obesogenic eating patterns (Birch & Fisher, 2000; Fisher & Birch, 1999). A parent who is responsive during feeding but has a low degree of control/demand is classified as *indulgent* (no set limits on type or quantity of food consumed). Parents with a high degree of both control and responsiveness have a *responsive* feeding style (attentive to child cues while monitoring child's diet). Finally, parents who have both low control and

responsiveness during feeding are classified as *laissez-faire* (no limits on type or quantity of food as well as no response to child cues).

Past qualitative studies assessing feeding practices in mothers with eating disorders described above suggest that these mothers may have a heightened degree of control during feeding with a lack of responsiveness to child cues, potentially restricting child food intake (Agras, et al., 1999; Lacey & Smith, 1987; S. E. Mazzeo, et al., 2005). Based on these findings, several studies have attempted to describe how eating disorder symptoms could impact restrictive feeding practices in mothers with eating disorders, citing maternal obsessive compulsive symptoms (Farrow & Blissett, 2009) and mealtime disorganization (P. J. Cooper, Whelan, Woolgar, Morrell, & Murray, 2004) as major contributors. A study conducted in a large prospective population-based study of 100,000 births in Norway found that mothers with BN but not AN were more likely to report restrictive feeding styles than mothers without eating disorders (Reba-Harrelson et al., 2010). Several other studies have suggested that mothers with any eating disorder may be more likely to exhibit a restrictive feeding style (Duke, Bryson, Hammer, & Agras, 2004; Honjo, 1996; Russell, et al., 1998). Many of these studies measured feeding practices using the Childhood Feeding Questionnaire (Birch et al., 2001) which focuses on obesity proneness and provides scores in seven domains; three of these domains focus on parental control attitudes and practices in child feeding (pressure to eat, restriction, and monitoring). This questionnaire does not directly characterize responsive, indulgent, or *laissez-faire* feeding styles. To our knowledge, no studies have evaluated the prevalence

of the five major feeding styles among mothers with histories of eating disorders compared to mothers with no history.

II.C. Responsiveness in Feeding and Effects on Child Weight and Relationship with Food

Maternal responsiveness describes a mother's ability to recognize and respond appropriately to her child's verbal and nonverbal cues. Feeding responsiveness refers to a mother's ability to appropriately respond to her child's hunger and satiety cues. Decreased maternal responsiveness and increased control in the early feeding relationship have been associated with increased eating in the absence of hunger later in childhood (Fisher & Birch, 2002), which is thought to contribute to childhood overweight (Faith et al., 2004; Fisher & Birch, 2002; Francis & Birch, 2005; Lee, Mitchell, Smiciklas-Wright, & Birch, 2001). Low responsiveness during feeding has also been associated with child underweight, as parents of children with non-organic failure to thrive were observed to be less nurturant and more neglecting during feeding than parents of comparison children (Black, Hutcheson, Dubowitz, & Berenson-Howard, 1994).

Mothers with eating disorders may have unrealistic expectations about appropriate eating behavior for young children that may interfere with their ability to be flexible and responsive during feeding. For example, mothers with eating disorders were more likely than controls to report that their infants "dawdled" while eating (Agras, et al., 1999), and to describe their children as fussy or picky eaters (Evans & le Grange, 1995). Another study showed that mothers with eating disorders perceive their children as "greedy" when they request second

helpings (Russell, et al., 1998). Mothers with eating disorders are also more likely than controls to feed their infants on a rigid schedule and reported that they had difficulty coping when their infants appeared hungry outside of the scheduled feeding times (Evans & le Grange, 1995). Some mothers interpreted this as indicating that their parenting skills were inadequate. Others thought that it might indicate that they were passing on their struggles with food to their children (Evans & le Grange, 1995).

Mothers with AN report using rigid rules to govern their feeding practices rather than responsiveness to their child's hunger cues (Reba-Harrelson, et al., 2010; Russell, et al., 1998). Their ability to respond appropriately during mealtimes may be compromised by anxiety at mealtimes, fears about child overeating and weight gain, and social cognitive styles that challenge their ability to appraise their children's cues (S. E. Mazzeo, et al., 2005; Zucker, et al., 2007). In cases describing food deprivation in children of mothers with AN, after seeing a physician, mothers were able to follow a prescribed proper diet for their children, and the children's delayed growth improved (Russell, et al., 1998; van Wezel-Meijler & Wit, 1989). This suggests that these mothers may lack sensitivity to their children's feeding cues rather than intentionally ignoring these cues to alter child weight. The consequences of decreased responsiveness during feeding could be particularly detrimental in offspring who may be at increased genetic risk for eating disorders.

II.D. Self-Reported Measurement of Maternal Responsiveness

Maternal self-report of perceived responsiveness is also important to assess in order to determine congruence between observed and perceived responsiveness. In a study evaluating feeding styles in 20 African-American women in North Carolina, there was a lack of correspondence between observed and reported feeding styles in over 2/3 of the sample (Sacco, Bentley, Carby-Shields, Borja, & Goldman, 2007). The authors conclude that valuable information may be obtained from the combination of both observation and self-report assessment techniques, as each method has unique strengths and weaknesses.

Indeed, a parent's perceived parenting skills or behaviors may have a great influence on their observed behaviors. A study evaluating the development of behavioral problems in children found that mothers who were observed to have low parenting responsiveness and also perceived themselves to be unresponsive had children with greater behavioral problems than mothers who were observed to be unresponsive but perceived themselves as highly responsive to their child's needs (Mills-Koonce et al., 2009). A study of parenting for preterm infants found that mothers with higher reported responsiveness also reported greater parenting self-efficacy (Amankwaa, Pickler, & Boonmee, 2007). Other studies have found increased maternal self-efficacy to be an important predictor of observed responsiveness in the first year (Drake, Humenick, Amankwaa, Younger, & Roux, 2007; Shin, Park, & Kim, 2006). Self-reported maternal stress has been found to be negatively related to responsiveness in

several studies (Belsky & Fearon, 2002; Cummings & Davies, 1994; Field, 1998).

In sum, both parenting self-efficacy and parental stress have been shown to influence maternal responsiveness. Incorporation of measures of efficacy and stress in Aim 2 of this project will allow us to compare self-reported parenting measures with observed maternal responsiveness in mothers with histories of eating disorders.

II.E. Other Factors Influencing Maternal Responsiveness

Depression also impacts maternal responsiveness. Greater maternal depressive symptoms are associated with lower levels of maternal ‘sensitivity’, a term which describes more global maternal functioning, but encompasses maternal responsiveness (Mills-Koonce, Gariepy, Sutton, & Cox, 2008). Maternal sensitivity includes a number of maternal qualities, such as affect, timing, flexibility, conflict negotiation, and awareness of child’s cues, as well as appropriate responsiveness (Ainsworth, Blehar, Waters, & Wall, 1978). While most mothers exhibit increasing sensitivity throughout the first few years of their child’s life, higher maternal depressive symptoms are associated with decreasing sensitivity from 6 to 36 months of age (Mills-Koonce, et al., 2008). In relation to feeding, maternal symptoms of stress, depression, and anxiety have been associated with decreased responsiveness during feeding and increased use of controlling feeding practices (Farrow & Blissett, 2005; Francis, Hofer, & Birch, 2001; Haycraft & Blissett, 2008, 2011; Hurley, Black, Papas, & Caulfield, 2008). The prevalence of major depressive disorder in individuals with histories of AN or

BN has been reported at 39-50% (Hudson, et al., 2007), and estimates including individuals with a history of eating disorder not otherwise specified (EDNOS) have been as high as 73% (Fernandez-Aranda et al., 2007); therefore, it is important to evaluate depressive symptoms in both mothers with histories of eating disorders and healthy control mothers and include depression as a covariate in analyses to determine the effect of eating disorder history on maternal responsiveness independent of depressive symptoms.

Breastfeeding is also associated with maternal responsiveness. Mothers who breastfeed display increased responsiveness during early infancy, and duration of breastfeeding is positively associated with maternal responsiveness (Britton, Britton, & Gronwaldt, 2006). Mothers with current eating disorders have considerable difficulty initiating and maintaining breastfeeding, but it is unknown if mothers who are clinically recovered from an eating disorder experience similar problems (Evans & le Grange, 1995; Lacey & Smith, 1987; Stein & Fairburn, 1989; Torgersen et al., 2010). Breastfeeding status and duration will be another important covariate in the analysis of maternal eating disorder history and responsiveness.

Not only maternal variables influence responsiveness; child characteristics and behaviors also impact maternal responsiveness. *Infant attachment quality and negative affect* can have a substantial impact on maternal responsiveness. Maternal responsiveness is decreased when infants are classified as avoidant compared to securely attached (Mills-Koonce et al., 2007). In addition, maternal responsiveness has been shown to decrease at high levels of infant negative

affect (Mills-Koonce, et al., 2007). This may demonstrate mothers' difficulty in responding to either disinterested or negative child cues; however, the interplay between mother and child represents a complex reciprocal system, and determination of the direction of causality is not always clear, nor is it simple.

II.F. Exploring Parasympathetic Response During Mother-Child Interactions: Vagal Reactivity

Maternal reactivity and self-regulation are biologically rooted in the parasympathetic and sympathetic arms of the autonomic nervous system. In order to be responsive to her child, a mother must fix attention on her child, alter her facial expression, and often make vocalizations. The vagal system, which regulates parasympathetic activity, has been shown to mediate these social behaviors in mammals and support pair-bonding behavior (Porges, 1998). Thus, measuring vagal reactivity in mothers during interactions with their children provides an index of psychophysiologic support for social engagement (Mills-Koonce, et al., 2007; Porges, 1998).

A commonly used index of vagal tone is heart rate variability. By measuring the variability of cardiac inter-beat intervals, one can determine degree of vagal or parasympathetic tone. Increased heart rate variability is associated with increased vagal tone and decreased variability is associated with vagal withdrawal (Porges, Arnold, & Forbes, 1973). The change in vagal tone in response to an environmental stimulus is termed vagal reactivity. Vagal withdrawal during episodes of environmental challenge or stress is associated with greater self-regulation and preparedness to either engage the source of

challenge or flee from it (Calkins, 1997; Porges, 1996). Vagal withdrawal in mothers in response to child distress is associated with increased observed maternal responsiveness, suggesting that vagal reactivity may be a useful physiologic index of maternal engagement and responsiveness (Mills-Koonce, et al., 2007).

Heart rate variability has been assessed in underweight patients acutely ill with AN in an effort to better understand the cardiac effects of eating disorders. These patients display increased heart rate variability or vagal tone and decreased vagal reactivity in response to physiologic stress tests, a finding consistent with orthostatic hypotension characteristic of severely underweight hospitalized AN patients (Ishizawa, Yoshiuchi, Takimoto, Yamamoto, & Akabayashi, 2008; Lachish et al., 2009; Murialdo et al., 2007; Rechlin, Weis, Ott, Bleichner, & Joraschky, 1998). Several, but not all (Rechlin, et al., 1998) studies have demonstrated that vagal reactivity remains decreased in individuals with eating disorders after weight restoration and recovery (Lachish, et al., 2009; Messerli-Burgy, Engesser, Lemmenmeier, Steptoe, & Laederach-Hofmann, 2010). Vagal reactivity in response to mother-child interactions has never been measured in individuals with histories of eating disorders. Thus, Aim 3 represents an exploratory aim to determine feasibility of the proposed methods for collecting vagal reactivity data and to generate hypotheses for future psychophysiologic research with this group.

II.G. Summary

In sum, a mother's ability to respond to her child's cues during feeding can have a great impact on the child's eating behavior. Children of mothers who are highly controlling of food intake and lack responsiveness to child cues display less ability to self-regulate their diets later in childhood (Fisher & Birch, 2002). Thus, practicing responsive feeding may promote self-regulation of eating for children and buffer risk for later disordered eating habits such as loss of control over eating or binge eating. The feeding situation poses enormous difficulty for mothers with histories of eating disorders, potentially challenging their ability to be appropriately responsive to their children's cues. Thus, the overall goal of this project is to gain a comprehensive view of maternal responsiveness in mothers with histories of eating disorders. The combination of observational, self-report, and physiologic measures allows us to capture not only how the mother is acting, but how she is perceiving her own behavior and reacting biologically during interactions with her child. This novel paradigm has the potential to provide critical information to inform the development of tailored behavioral preventive interventions to assist mothers with histories of eating disorders in developing feeding behaviors that provide some protection against the emergence of unhealthy eating patterns.

Anorexia Nervosa	<ul style="list-style-type: none"> • Failure to maintain body weight at or above a minimally normal weight for age and height • Intense fear of gaining weight or becoming fat, even though underweight • Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation , or denial of the seriousness of the current low body weight • Amenorrhea in postmenarchal girls and women
Bulimia Nervosa	<ul style="list-style-type: none"> • Recurrent episodes of binge eating • Recurrent inappropriate compensatory behavior to prevent weight gain, such as: self-induced vomiting; misuse of laxatives, diuretics, or other medications; fasting; excessive exercise • The binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for three months • Self-evaluation is unduly influenced by body shape and weight • The disturbance does not occur exclusively during episodes of anorexia nervosa
Eating Disorder Not Otherwise Specified	<ul style="list-style-type: none"> • All of the criteria for anorexia nervosa are met except that the individual has regular menses • All of the criteria for anorexia nervosa are met except that, despite substantial weight loss, the individual's weight is in the normal range • All of the criteria for bulimia nervosa are met except that binge eating and inappropriate compensatory mechanisms occur at a frequency of less than twice a week or for a duration of less than three months • Regular use of inappropriate compensatory behavior by an individual of normal body weight after eating small amounts of food • Repeatedly chewing and spitting out large amounts of food

Figure 2.1. DSM-IV criteria are listed for anorexia nervosa, bulimia nervosa, and eating disorder not otherwise specified. All criteria must be met for a diagnosis of anorexia nervosa or bulimia nervosa. Diagnosis of eating disorder not otherwise specified is made if one of the criteria listed is satisfied.

CHAPTER III

INFANT AND TODDLER FEEDING PRACTICES OF MOTHERS WITH EATING DISORDERS

III.A. Abstract

Background: Little is known about the specific food choices mothers with eating disorders make for their young children.

Objective: To evaluate the feeding styles, food choices, and special approaches used during feeding by mothers with histories of eating disorders and compare these feeding practices to those of mothers with no such history.

Design: For this case-control study, 25 mothers with histories of eating disorders with children ages 6-36 months were matched with 25 mothers with no history of an eating disorder based on child age group (within 6 months) and child sex. Mothers were compared on self-reported feeding style, child diet, and use of special feeding approaches.

Results: Mothers with histories of eating disorders had a lower mean score for restrictive feeding than control mothers ($p < 0.05$). No significant differences were found between groups in the percentage of mothers who breastfed, duration of breastfeeding, age at solid food introduction, number of meals or snacks per day, daily servings of fruit and vegetables, or daily servings of protein foods. Mothers with histories of eating disorders were more likely to report taking special

approaches to feeding that restrict certain types of foods (88% mothers with eating disorders and 60% control mothers; Fisher's exact test $p < 0.05$).

Conclusions: Although mothers with histories of eating disorders may not differ from control mothers in their overall feeding patterns and child diet composition, they may be more likely to take special approaches to feeding which mirror dietary rules common in individuals with eating disorders.

III.B. Introduction

An estimated 2.4% of women of childbearing age in the United States have met threshold DSM IV criteria for either AN or BN in their lifetime (Hudson, et al., 2007). Fertility rates in women with current and past eating disorders appear to be similar to the general population, demonstrating that despite disordered eating behaviors and menstrual irregularities, many women with eating disorders become pregnant (Brinch, et al., 1988; Bulik, et al., 1999; Wentz, Gillberg, Gillberg, & Rastam, 2005). Compared with offspring of healthy women, the children of mothers with eating disorders tend to weigh less at birth and throughout the first few years of life and have greater risk of early feeding problems and non-organic failure to thrive (Micali, et al., 2009). In childhood they exhibit greater dietary restraint and concern about shape and weight than children of healthy mothers (Woodside & Shekter-Wolfson, 1990). These observations suggest elevated risk for eating disorders among these children as they reach adolescence. Eating disorders are clearly complex traits influenced by both genetic and environmental factors (S. Mazzeo, et al., 2006). Although we

are not yet to the point where we can identify genetic risk, one environmental factor that represents a potential critical avenue for early preventive intervention is the maternal-child feeding environment (S. E. Mazzeo, et al., 2005).

Few studies have been conducted evaluating specific food choices made by mothers with eating disorders for their young children. One study using a three-day dietary recall reported no major differences in macro- or micronutrient consumption of 1-3 year old children of mothers recovering from eating disorders compared with children of control mothers (Waugh & Bulik, 1999). Several studies have suggested that mothers with eating disorders may be more likely to exhibit a restrictive feeding style, characterized by close monitoring of child food consumption and overt limitation of types or quantities of foods offered (Agras, et al., 1999; Duke, et al., 2004; Honjo, 1996; S. E. Mazzeo, et al., 2005; Reba-Harrelson, et al.). Yet, these studies did not examine the actual composition of the diets of children of mothers with eating disorders. In addition, while mothers with eating disorders may be more restrictive in feeding their young children, we do not understand specifically how this restriction manifests (e.g., Are mothers with eating disorders more likely to restrict the quantity or quality of foods offered?). Therefore, the objective of this study was to evaluate the feeding styles, food choices, and special approaches used during feeding by mothers with histories of eating disorders and compare these feeding practices to those of mothers with no such history. We hypothesized that mothers with histories of eating disorders would have higher scores on restrictive feeding, and that this would be manifested as more dietary rules for their children including no fruit

juice, no sweets, and more restrictive special approaches to feeding such as low processed, no added sugar, or organic foods only.

III.C. Methods

Participants

Women with a history of an eating disorder with children between the ages of 6 and 36 months were recruited from the community through emails and fliers distributed to university students and staff, mother's clubs, and local daycare centers. Thirty-three women were screened and interviewed using the Structured Clinical Interview for DSM-IV Axis I Disorders-Patient Edition (SCID-I/P)(First, Spitzer, Gibbon, & Williams, 2002), and twenty-five women met inclusion criteria for previous history of either AN, BN, or EDNOS. Women with a history of *only* binge eating disorder (BED) or a BMI greater than 30 kg/m² were not included in this study, as the literature on child feeding in both of these groups suggests that they may behave differently than mothers with AN, BN, or EDNOS due to a greater focus on childhood overweight and less concern over modeling unhealthy body shape and weight attitudes toward their children (Birch & Fisher, 2000; Faith, et al., 2004; Reba-Harrelson, et al.). Participants must not have met threshold criteria for AN, BN, or EDNOS in the past 28 days and must have maintained a BMI of at least 18.5 kg/m² for the three months prior to participation.

Twenty-five control women with children between the ages of 6 and 36 months who had never experienced an eating disorder were recruited similarly

from the community. Eligible mothers who had not met lifetime DSM-IV criteria for AN, BN, BED, or EDNOS according to the SCID-I/P and who had a BMI between 18.5 and 30 kg/m² were matched to case women based on child age group (within 6 month age bands) and child sex. Although participants were not individually matched in a pairwise way, they were recruited in such a way that the cases and controls had the same proportion of child age groups and child sexes.

Exclusion criteria for both cases and controls were psychosis, including schizophrenia, bipolar I disorder, current significant suicidal ideation, alcohol or drug dependence in the past year, and any social service inquiries regarding child neglect. No women were excluded based on these criteria.

All mothers were screened by phone, and eligible participants were then visited in their homes where a clinical interview was conducted to determine relevant Axis I diagnoses. If mothers were still eligible after interview, they were given a packet of questionnaires that they were instructed to complete over the following week and return to the study coordinator in the mail. There was a 100% completion rate from eligible participants.

Mothers received a \$20 gift certificate for their participation in this study. Ethical approval for this study was granted by the Biomedical Institutional Review Board of The University of North Carolina at Chapel Hill, and all participants provided informed consent.

Measures

Clinician-Administered Assessments

The Structured Clinical Interview for DSM-IV Axis I Disorders-Patient Edition. The SCID-I/P [Modules A(Mood), B/C(Psychotic Screen), E(Substance Use Disorders) and H(Eating Disorders)](First, et al., 2002) was used to assess eating disorder history and comorbid Axis I disorders (alcohol or drug dependence and psychosis including schizophrenia and bipolar I disorder). The SCID-I/P is a semi-structured interview which was conducted by a clinical interviewer trained to criterion.

Anthropometric Data. Participants' weight was assessed using a digital scale (Tanita HD-351 Digital Weight Scale); scales were calibrated regularly according to protocol. A stadiometer was used to assess all participants' height. BMI was then calculated as $\text{weight (kg)} / (\text{height (m)})^2$. Children were weighed wearing only a clean diaper using a digital scale (Tanita BD-585 Digital Baby Scale). Child length was measured three times in the recumbent position using a calibrated length board (O'Leary Length Board) by two trained research staff, and the average of the three measurements was recorded. Child weight and length was then converted into age and sex-specific z-scores per the revised growth charts from the Centers for Disease Control and Prevention (Kuczmarski et al., 2000).

Self-Report Assessments

Infant Feeding Style Questionnaire (IFSQ). The IFSQ is a self-report measure of parents' beliefs about how to best feed their child and what parental behaviors they exhibit when feeding their child. Subscale scores are calculated as means of the response items (coded on a 5-point scale) for each of five major feeding styles: (1) *laissez-faire*, which describes parents who place few limits on quantity or quality of food and take an overall 'hands-off' approach to feeding, (2) *pressuring*, which describes parents who pressure their children to eat more food and use foods to comfort their children, (3) *restrictive*, which describes parents who place overt limitations on quantity and/or quality of foods consumed, (4) *indulgent*, which describes parents who place no limits on quantity or quality of foods consumed, while also being highly involved with feeding, and (5) *responsive*, which describes parents who pay close attention to their children's hunger and satiety cues and monitor the quality of their diet. Sample items from each of the five major feeding style subscales are given in Table 3.1. A complete description of all items loading onto each feeding style has been published previously (Thompson, et al., 2009). Categorical confirmatory factor analysis has been used to validate that items hypothesized *a priori* as measures of each of the five major feeding styles yielded well-fitting models in two independent samples of low-income African-American mothers of infants and young children (Thompson, et al., 2009).

Toddler Diet Questionnaire. The toddler diet questionnaire is a semi-quantitative food frequency questionnaire adapted from the Infant and Toddler

Diet Questionnaire used to assess dietary/feeding practices of mothers in the Women, Infant, and Children federal nutrition program in the United States (Toddler Diet Questionnaire, 2007). The questionnaire assesses frequency, type, and amount of consumption of proteins, fruits and vegetables, milk, juice, sweets, and snack items. Breastfeeding status, breastfeeding duration, and timing of introduction of complementary foods are also assessed. Lastly, the questionnaire was adapted to include a 'special approaches' section, which asked mothers if they followed any special approaches when feeding their children. Options for special approaches included low/no processed foods, organic foods only, no sugar added, gluten free, lactose free, low/no carbohydrate, and low/no fat.

Eating Disorder Examination Questionnaire (EDE-Q). The EDE-Q is well-studied and frequently used 36-item self-report questionnaire modeled after the Eating Disorder Examination semi-structured interview (C. G. Fairburn & Cooper, 1993) designed to assess eating disorder symptoms over the previous 28 days (C. G. Fairburn & Beglin, 1994). The questionnaire yields four subscale scores which range from 0 to 6 (Dietary Restraint, Eating Concern, Shape Concern, and Weight Concern) as well as a Global score which is the average of the four subscales. Mean EDE-Q global score for individuals with eating disorders in a community sample was 3.09, while mean global score was 1.30 in individuals without eating disorders (Mond, Hay, Rodgers, Owen, & Beumont, 2004). The subscales have high internal consistency ($\alpha = 0.78-0.93$) and two-week test-retest reliability (Pearson $r = 0.81-0.94$) within a community sample (Luce & Crowther, 1999).

Beck Depression Inventory-II (BDI-II). The BDI-II is a 21-item self-report questionnaire that was used to assess the severity of current depressive symptoms; the revised version extends the reporting time frame to two weeks and has good internal consistency in postpartum mothers ($\alpha = .94$) (Britton, 2011) and one-week test-retest reliability ($r = 0.93$) (Beck, Steer, Ball, & Ranieri, 1996). Mean BDI-II score was 8.47 in a community sample of mothers one month postpartum (Britton, 2011), 5.2-6.4 in individuals recovered from eating disorders, and 1.1 in a non-eating disorder community sample (Wagner et al., 2006).

Beck Anxiety Inventory (BAI). The BAI is a 21-item self-report questionnaire that was used to assess current anxiety. The BAI focuses on somatic symptoms of anxiety over the past week. Convergence with other measures of anxiety has been demonstrated; the BAI has high internal consistency ($\alpha = 0.92$) and test-retest reliability over one week ($r = 0.75$) in a sample of psychiatric outpatients (Beck, Epstein, Brown, & Steer, 1988).

Statistical Analyses

All analyses were conducted with SAS version 9.2 (*SAS/STAT® Software: Version 9*, 2004). Means and standard deviations are presented for all continuous variables and percent distribution for categorical variables. Student's *t*-tests were used to evaluate differences between groups for continuous variables. Fisher's exact test was used to evaluate differences between groups for categorical variables. Standardized effect sizes were calculated as Cohen's *d* for continuous variables, odds ratios (OR) for binary categorical variables, and

gamma values for categorical variables with greater than two categories. There were missing data for several demographic variables for one participant due to her choice not to disclose information about current weight or level of education. Data were also considered missing for subscale scores of the IFSQ when a participant responded 'not applicable' to more than one response item loading on to a particular subscale. If a participant responded 'not applicable' to only one item for a subscale of the IFSQ, the mean subscale score was calculated without that item. All significance tests were two-tailed, and a p value of $<.05$ was considered significant. A sample size of 25 participants per group was chosen for this pilot study in order to have 80% power at $\alpha=0.05$ (two-tailed) to detect an effect size of 0.8 between groups, an effect size considered large (SAS®; (Cohen, 1992; Toddler Diet Questionnaire, 2007)). Because this was a pilot study, it was not reasonable to expect that the study would have power to detect medium or small effect sizes. This study supplies proof of concept and preliminary data which can be used to justify further larger studies. Given that this was a small study that was hypothesis driven but also intended to generate hypotheses for future larger studies and statistical power was low, no correction was made for multiple testing.

III.D. Results

Maternal Characteristics

The sample comprised 50 mothers of children ages 6-36 months (25 with a history of an eating disorder and 25 matched controls). Of the 25 women with a

history of an eating disorder, 13 had a history of AN (9 restricting type and 4 binge-purge type), 13 had a history of BN (6 non-purging type and 7 purging type), 2 had a history of BED (in addition to another past eating disorder diagnosis), and 2 had a history of EDNOS (both met all criteria for AN except their lowest BMI was $>18.5\text{kg/m}^2$). Three women had a history of two different eating disorder diagnoses (AN and BN, AN and BED, BN and EDNOS), and one woman had a history of three different eating disorder diagnoses (AN, BN, and BED).

Characteristics of participating mothers and their children age 6-36 months are found in Table 3.2. Mothers with histories of eating disorders were significantly older ($32.72 \text{ years} \pm 4.61$) than control mothers ($29.68 \text{ years} \pm 1.99$; $t(df)=3.02(48)$, $p<0.01$). The two groups did not differ significantly in their level of education, race, or parity. The majority of mothers in both groups was white and had at least a college degree. The groups did not differ significantly on mothers' current BMI or highest non-pregnant adult BMI, but mothers with histories of eating disorders reported a significantly lower lifetime BMI ($18.22 \text{ kg/m}^2 \pm 1.90$) than control mothers ($20.34 \text{ kg/m}^2 \pm 2.31$; $t(df)= -3.55(48)$, $p<0.01$). Mothers with histories of eating disorders also had significantly higher scores on current eating disorder symptoms on the EDE-Q compared with control mothers, but scores in both groups were lower than published scores of individuals with current eating disorders (Mond, et al., 2004). The groups did not differ significantly on reported symptoms of depression measured with the BDI-II, but mothers with histories of

eating disorders reported greater anxiety in the past week on the BAI (4.56 ± 3.80) than control mothers (2.58 ± 1.80 ; $t(df)=2.95(48)$, $p<0.01$).

Child Characteristics

Control mothers were matched to mothers with histories of eating disorders based on child age group and child sex. There was no significant difference between groups in child birth weight or child's current weight-for-length z-score (Table 3.2).

Feeding Style

Feeding style scale scores from the IFSQ are presented in Table 3.3. The groups did not differ significantly on scores of laissez-faire, pressuring, indulgent, or responsive feeding styles. Mothers with histories of eating disorders scored significantly lower on the restrictive feeding style subscale than control mothers (2.34 ± 0.45 and 2.60 ± 0.41 respectively; $t(47)= -2.08$, $p<0.05$, $d=0.61$). Both groups scored highest on responsive feeding out of the five feeding style subscales.

In a post-hoc analysis to ensure our observations were not strongly related to maternal age, we evaluated the association between maternal age and subscale score for restrictive feeding. There was a small negative correlation between maternal age and restrictive feeding ($r= -0.13$) that was not statistically significant ($p<0.37$).

Breastfeeding

Mothers with histories of eating disorders did not differ significantly from control mothers in percentage breastfeeding longer than one month, percentage currently breastfeeding, or overall duration of breastfeeding (for those mothers in each group who had stopped breastfeeding; 12 mothers with histories of eating disorders and 15 control mothers; Table 3.4). Mean duration of breastfeeding for both groups was about one year (11.92 ± 5.69 months for mothers with histories of eating disorder and 12.87 ± 5.72 months for controls). All but one mother in each group breastfed for at least one month. Groups did not differ significantly in child age at introduction of solid foods. The majority of children in both groups was introduced to solid food between 4-6 months of age (Table 3.4).

Diet Choice and Feeding Practices

Mothers' diet choices for their children and feeding practices are represented in Table 3.4. No significant difference was found between groups for number of meals or snacks per day, daily servings of fruit and vegetables, or daily servings of protein foods. Groups were also similar in percentage of mothers who reported that their child never drank juice (64% mothers with histories of eating disorders and 56% control mothers) or never ate sweets (28% mothers with histories of eating disorders and 24% control mothers).

When asked if they took any special approaches to feeding their child, mothers with histories of eating disorders were more likely to report a special approach to feeding than control mothers (88% mothers with histories of eating

disorders and 60% control mothers; Fisher's exact test $p < 0.05$, OR(95% CI)= 4.89(1.15-20.79); Table 3.5). The most commonly reported special approach in both groups was limiting the amount of processed food (60% mothers with histories of eating disorders and 36% control mothers). Groups did not differ significantly in the percentage of mothers who reported feeding foods that were organic only, no added sugar, gluten free, lactose free, low fat, low carbohydrate, and contained no animal products. Mothers were also able to note other special approaches that were not included as options on the questionnaire. Other special approaches reported included no fast food (1 mother with eating disorder and 1 control mother), nitrate-free hot dogs (1 mother with eating disorder), no beef (2 mothers with eating disorders), hormone-free and grain-fed meats only (1 mother with eating disorder and 1 control mother), no high-fructose corn syrup (1 mother with eating disorder and 1 control mother), homemade foods only (2 control mothers), and simple foods only (1 control mother).

III.E. Discussion

Subtle differences emerged in feeding practices between mothers with histories of eating disorders and control mothers. On some core parameters, no significant differences emerged, such as food frequency measures and prevalence and duration of breastfeeding. Likewise, most children in both groups were introduced to solid foods at 4-6 months of age, the time period recommended by the American Academy of Pediatrics (Gartner et al., 2005).

In terms of feeding styles, both mothers with histories of eating disorders and control mothers scored highest on the responsive feeding subscale. Contrary to our hypothesis, the only difference between groups in feeding style scores was that mothers with histories of eating disorders had a lower mean score for restrictive feeding than control mothers. Despite this difference, scores were low for the restrictive feeding style subscale in both groups. Previous literature has suggested that breastfeeding may help to protect mothers against restrictive and pressuring feeding practices and promote more responsive feeding (Blissett & Farrow, 2007; Fisher, Birch, Smiciklas-Wright, & Picciano, 2000; Taveras et al., 2004), as breastfeeding eliminates the option of feeding a set quantity of food and allows parents to become more sensitive to infant hunger and satiety cues. In our sample, all but one mother in each group breastfed for greater than one month, and the mean duration of breastfeeding for mothers who had weaned their children was around 12 months. Thus, the high prevalence and long duration of breastfeeding in our sample may explain the high scores in responsive feeding and relatively low scores in restrictive and pressuring feeding styles in both groups.

The lower mean score for the restrictive feeding style subscale in mothers with histories of eating disorders compared to controls has not been reported in previous studies. Eating disorder history has been positively associated with restrictive feeding practices at 7 years of age (Duke, et al., 2004) but not at 1 year (Farrow & Blissett, 2005). Additionally, anxiety during the postnatal period predicts restrictive feeding at 1 year (Farrow & Blissett, 2005). In our sample,

mothers with histories of eating disorders had higher scores on both disordered eating and anxiety symptoms than controls, yet they scored lower on the restrictive feeding subscale. Our sample included a large number of women with histories of AN-like presentations (AN or EDNOS characterized by subthreshold AN; 15 out of the 25 mothers with eating disorders had a history of either AN or EDNOS). This sample composition could explain the lower levels of restrictive feeding reported; a population-based study of feeding styles in mothers with eating disorders found that mothers with BN and BED reported higher levels of restrictive feeding than mothers with no eating disorder, but mothers with AN actually reported lower levels of restrictive feeding similar to our finding (Reba-Harrelson, et al.). Lastly, several studies have found that maternal age is negatively associated with restrictive feeding (Blissett & Farrow, 2007; Taveras, et al., 2004), and mothers with histories of eating disorders were significantly older than control mothers in our sample. Our post-hoc analysis did not detect a significant association between maternal age and restrictive feeding rendering it unlikely that age alone is responsible for the observed difference between groups.

Mothers with histories of eating disorders were more likely to report taking some special approach to feeding their child. The most common special approach reported was limiting processed foods. This finding is particularly interesting given that women with histories of eating disorders may be more likely to be concerned with eating only 'healthy' foods in their own diet (Dellava, Hamer, Kanodia, Reyes-Rodriguez, & Bulik, 2010) or following specific dietary

rules meant to influence their shape or weight (Bardone-Cone et al., 2010; Z. Cooper & Fairburn, 1987). The nature of the questionnaire used did not allow us to determine whether the special approaches taken reflected rigid feeding rules or more flexible guidelines focused on healthy eating. It will be critical for future investigations to determine whether these special approaches are implemented covertly (e.g., the child is only given low processed foods in the home but is not aware of any explicit rules against eating processed foods) or overtly (e.g., the child is aware that he/she must not eat processed foods). The overt implementation of a special feeding approach would be consistent with a restrictive feeding style. Typically, however, these types of feeding behaviors (limiting processed foods, feeding organic or natural foods only) are not captured in questionnaires assessing feeding style (Birch, et al., 2001; Thompson, et al., 2009). Whether these special approaches could prove beneficial or harmful for children in later life is unknown, but past research has shown that overt restrictive feeding at a young age can lead to dysregulated eating later in life (Fisher & Birch, 2002).

Although novel and informative for future investigations, our study nonetheless has limitations that should be considered when interpreting the results. First, as this was a pilot study and the sample size was relatively small, we lacked power to detect small or medium effect sizes. Thus, all instances of failure to find a significant effect should not be taken to imply that there was no effect. Second, all data regarding mothers' food choices and feeding styles was based on self-report and is subject to social desirability bias as well as

participants' ability to accurately recall their children's food intake. Additionally, the feeding assessments used in this study (toddler diet questionnaire and the IFSQ) have not been validated in mothers with eating disorders, and these assessments may not capture more subtle restrictive feeding practices such as the special feeding approaches reported more frequently by mothers with histories of eating disorders. Third, the range of child ages (6-36 months) in this study was fairly broad. We matched control mothers for child age within 6 month age bands, so the mean child age between groups was not significantly different. However, the largest age group recruited was age 6-12 months—a time period when most children are just becoming accustomed to solid foods. While all the children in this study had been introduced to solid foods, 22 out of 50 mothers were still breastfeeding to some extent. Thus, these mothers' feeding practices and diet choices were likely just being established and could change significantly after the children are weaned. Due to our small sample size, we were unable to conduct a subgroup analysis and evaluate differences in feeding measures across age groups. Fourth, this was a non-randomized case-control study. Differences between cases and controls could plausibly be due to some unknown and unmeasured characteristic related to both case-ness and an outcome variable. Finally, the sample was largely white and educated, so findings may not be generalizable to all mothers with histories of eating disorders.

Overall, the results of this study present a unique pattern of feeding for mothers with histories of eating disorders that warrants further investigation.

These mothers reported a highly responsive feeding style, with less restrictive feeding than controls, and were more likely to report taking a special approach to feeding their child such as limiting processed foods or feeding organic foods only. Coupled with the mothers' own increased concerns over eating and general anxiety, the findings of responsive feeding involving 'special approaches' argues that these mothers may be more invested in their children's feeding. Future studies will need to investigate whether this increased attention to child feeding results in better self-regulation of eating and healthier diets or more rigid dietary rules that are perceived by children as restrictive.

Table 3.1. Sample Items from the Infant Feeding Style Questionnaire

Feeding Style	No. Items	Sample Items
Laissez-Faire	11	A toddler should be able to eat whatever s/he wants for snacks I watch TV while feeding (child) I keep track of how much food (child) eats ¹
Pressuring	17	I try to get (child) to eat even if not hungry It is important for a toddler to finish all the food on his/her plate When (child) cries, I immediately feed him/her
Restrictive	11	I carefully control how much (child) eats A toddler should never eat sugary food like cookies A toddler should only eat healthy food
Indulgent	32	I allow (child) to eat desserts/sweets if s/he wants Toddlers should be allowed to watch TV while eating to keep them from crying I allow (child) to eat fast food to keep him/her happy
Responsive	12	I let (child) decide how much to eat (Child) knows when s/he is full It is important to help or encourage a toddler to eat

¹Item reverse scored

Table 3.2. Demographic and Clinical Characteristics of Mothers and Children

	Mothers with Histories of Eating Disorders	Control Mothers	
	Mean (SD) or No. (%)	Mean (SD) or No. (%)	Test Statistic and p-value
Maternal Measures			
Age (y)	32.72 (4.61)	29.68 (1.99)	$t(48) = 3.02, p < 0.01^1$
Current BMI (kg/m ²)	22.37 (2.69)	23.04 (3.04)	$t(47) = -0.82, p < 0.42$
Lowest Adult BMI (kg/m ²)	18.22 (1.90)	20.34 (2.31)	$t(48) = -3.55, p < 0.01^1$
Highest Adult BMI (kg/m ²)	24.25 (3.46)	24.08 (2.98)	$t(48) = 0.18, p < 0.86$
Parity	1.40 (0.87)	1.28 (0.54)	$t(48) = 0.59, p < 0.57$
Education			FET, $p < 0.32$
GED or High School	1 (4)	0 (0)	
Some College	0 (0)	3 (12)	
College Graduate	7 (29)	8 (32)	
Post Graduate Degree	16 (67)	14 (56)	
Race			FET, $p < 0.99$
White	24 (96)	24 (96)	
Other	1 (4)	1 (4)	
EDE-Q			
Global	1.71 (1.40)	0.91 (0.83)	$t(48) = 2.46, p < 0.02^1$
Restraint	1.28 (1.40)	1.17 (1.25)	$t(48) = 0.30, p < 0.77$
Eating Concern	1.14 (1.25)	0.20 (0.22)	$t(48) = 3.73, p < 0.01^1$
Shape Concern	2.23 (1.92)	1.20 (1.16)	$t(48) = 2.30, p < 0.03^1$
Weight Concern	1.86 (1.60)	0.90 (0.97)	$t(48) = 2.59, p < 0.02^1$
BDI-II	5.68 (5.46)	4.32 (4.69)	$t(48) = 0.94, p < 0.35$
BAI	4.56 (3.80)	2.58 (1.80)	$t(48) = 2.95, p < 0.01^1$
Child Measures			
Age (mo)	18.92 (9.76)	19.56 (9.35)	$t(48) = -0.24, p < 0.81$
6-12 months	8 (32)	8 (32)	matched ²
13-18 months	5 (20)	5 (20)	
19-24 months	4 (16)	4 (16)	
25-30 months	3 (12)	3 (12)	
31-36 months	5 (20)	5 (20)	
Child Sex			matched ²
Male	13 (52)	13 (52)	
Birth Weight (g)	3434.8 (438.5)	3347.5 (370.6)	$t(48) = 0.76, p < 0.45$
Current Weight-for-Length z-score	0.16 (0.60)	0.15 (1.01)	$t(47) = 0.03, p < 0.98$
FET=Fisher's Exact Test, EDE-Q=Eating Disorders Examination Questionnaire, BDI=Beck Depression Inventory, BAI=Beck Anxiety Inventory			
¹ $p < 0.05$			
² Control mothers were matched to cases based on child age group and sex			

Table 3.3. Feeding Style Scale Scores from the Infant Feeding Style Questionnaire

	Mothers with Histories of Eating Disorders	Control Mothers		
<i>Feeding Style</i>	Mean (SD)	Mean (SD)	Test Statistic and <i>p</i> -value	Cohen's <i>d</i>
Laissez-Faire	2.11 (0.39)	2.27 (0.24)	$t(43) = -1.65, p < 0.11$	0.50
Pressuring	1.78 (0.57)	1.85 (0.31)	$t(45) = -0.52, p < 0.61$	0.15
Restrictive	2.34 (0.45)	2.60 (0.41)	$t(47) = -2.08, p < 0.05^1$	0.61
Indulgent	1.27 (0.26)	1.18 (0.17)	$t(46) = 1.35, p < 0.19$	0.40
Responsive	4.02 (0.33)	4.11 (0.43)	$t(46) = -0.74, p < 0.47$	0.22
¹ $p < 0.05$				

Table 3.4. Child Diet and Maternal Feeding Practices

Variable	Mothers with Histories of Eating Disorders	Control Mothers	Test Statistic and <i>p</i>-value		Effect Size
	No. (%) or Mean (SD)	No. (%) or Mean (SD)			
Breastfed >1 month	24 (96)	24 (96)	FET,	<i>p</i> < 0.99	1.00 (0.06-16.93) ¹
Currently Breastfeeding	13 (52)	9 (36)	FET,	<i>p</i> < 0.39	1.93 (0.62-5.98) ¹
Age at Solid Food Introduction:			FET,	<i>p</i> < 0.19	0.17 (0.02-1.55) ¹
4-6 Months	20 (80)	24 (96)			
After 7 Months	5 (20)	1 (4)			
Duration of Breastfeeding (if no longer breastfeeding; in mo.)	11.92 (5.69)	12.87 (5.72)	<i>t</i> (25) = -0.43, <i>p</i> < 0.67		0.17 ²
No. Meals/day	3.00 (0.58)	3.28 (0.61)	<i>t</i> (48) = -1.66, <i>p</i> < 0.10		0.48 ²
No. Snacks/day	1.76 (0.97)	2.00 (0.76)	<i>t</i> (48) = -0.97, <i>p</i> < 0.34		0.28 ²
Servings of Protein/day	2.73 (0.93)	2.42 (0.65)	<i>t</i> (44) = 1.31, <i>p</i> < 0.19		0.39 ²
Servings of Fruits and Vegetables/day	3.00 (1.10)	3.36 (0.99)	<i>t</i> (47) = -1.20, <i>p</i> < 0.24		0.35 ²
No Sweets	7 (28)	6 (24)	FET,	<i>p</i> < 0.99	1.23 (0.35-4.37) ¹
No Juice	16 (64)	14 (56)	FET,	<i>p</i> < 0.77	1.40 (0.45-4.35) ¹
Child Eats What Family Eats:			FET,	<i>p</i> < 0.11	0.43 ³
Most of the Time	12 (48)	17 (68)			
Sometimes	5 (20)	6 (24)			
Rarely	8 (32)	2 (8)			

FET=Fisher's Exact Test

¹Odds Ratio (95% confidence interval), ²Cohen's *d*, ³Gamma-value

Table 3.5. Special Approaches to Feeding Reported by Case and Control Mothers

		Mothers with Histories of Eating Disorders (n=25)	Control Mothers (n=25)		
Variable	Category	No. (%)	No. (%)	FET <i>p</i> - value	Odds Ratio (95% CI)
Any Special Approach		22 (88)	15 (60)	0.05	4.89 (1.15-20.79)
Specific Special Approach	Low Processed	15 (60)	9 (36)	0.16	2.67 (0.85-8.37)
	Organic Only	8 (32)	5 (20)	0.52	1.88 (0.52-6.84)
	No Added Sugar	9 (36)	8 (32)	0.99	1.19 (0.37-3.86)
	No Animal Products	1 (4)	1 (4)	0.99	1.00 (0.06-16.93)
	Gluten Free	0 (0)	1 (4)	0.99	--
	Lactose Free	0 (0)	0 (0)		--
	Low Fat	0 (0)	1 (4)	0.99	--
	Low Carbohydrate	0 (0)	0 (0)		--
	Other	6 (24)	6 (24)	0.99	1.00 (0.27-3.66)
FET=Fisher's Exact Test					

CHAPTER IV

RESPONSIVENESS DURING FEEDING IN MOTHERS WITH EATING DISORDERS

IV.A. Abstract

Objective. Our purpose was to describe comprehensively maternal responsiveness in mothers with histories of eating disorders relative to control mothers during both mealtime and playtime through the combined use of observational, self-report, and physiologic methods.

Methods. We conducted a case-control study of 25 mothers with histories of eating disorders with children ages 6-36 months and 25 healthy control mothers matched for child age group and child sex. Mothers completed self-report questionnaires assessing parenting self-efficacy and stress. Maternal responsiveness was assessed by video recording and behavioral coding of both a free play and typical feeding episode. Physiologic engagement was assessed through measurement of vagal reactivity during free play and feeding episodes.

Results. We found no significant difference between mothers with histories of eating disorders and control mothers in observed maternal responsiveness during feeding or free play interactions. Mothers with histories of eating disorders reported greater parenting stress ($t(47)= 2.15, p<0.04$) and exhibited less vagal withdrawal in response to both feeding and free play interactions ($F(1,43)= 7.18, p<0.02$).

Conclusions. Counseling of mothers with histories of eating disorders should include general stress management techniques and self-care. These mothers may have differences in their physiology which increase their vulnerability to stress, making it increasingly important as practitioners to ease concerns regarding child feeding and health and emphasize long-term strategies to manage anxiety related to parenting.

IV.B. Introduction

Children of mothers with eating disorders [AN, BN and some forms of EDNOS] are at greater risk for infant feeding problems and childhood disordered eating than children of healthy mothers (Brinch, et al., 1988; Bulik, et al., 2005; Micali, et al., 2009; Stein & Fairburn, 1989; Stice, Agras, & Hammer, 1999; Whelan & Cooper, 2000). Risk for eating disorders may be increased in offspring of affected women via passive gene-environment correlation (Plomin, et al., 1977); not only may these children inherit genes that place them at greater risk for developing eating disorders (Bulik, et al., 2006; Bulik, et al., 2000; S. Mazzeo, et al., 2006; Slof-Op 't Landt, et al., 2005), but they may also be exposed to disordered eating attitudes and behaviors that could further exacerbate risk (Striegel-Moore & Bulik, 2007). It is critical to understand which environmental factors may influence the development of healthy eating attitudes and behaviors in the children of mothers with eating disorders to facilitate prevention of disordered eating in the next generation.

Mothers with eating disorders self-report more controlling (restrictive or pressuring) feeding styles marked by overt control of types or quantities of foods rather than responsive feeding based on child feeding cues (Agras, et al., 1999; Duke, et al., 2004; Honjo, 1996; S. E. Mazzeo, et al., 2005; Reba-Harrelson, et al.); a concerning finding given that early restrictive feeding practices may lead to dysregulated eating in later childhood (Fisher & Birch, 2002). Mealtime observational studies of mothers with eating disorders have found increased conflict, more negative emotions expressed by child and mother, and fewer positive comments about food and eating compared with control mother-infant dyads (Stein, et al., 1994; Waugh & Bulik, 1999), but no studies have directly evaluated responsive feeding in mothers with eating disorder histories. These mothers may find it difficult to be responsive to their children's hunger and fullness cues due to mealtime anxiety, fears about child weight gain, and social cognitive styles influencing their ability to appraise cues (S. E. Mazzeo, et al., 2005; Zucker, et al., 2007). Clinical data evaluating vagal tone indicate that these women also exhibit decreased physiologic stress reactivity (Lachish, et al., 2009; Messerli-Burgy, et al., 2010; Murialdo, et al., 2007), conceivably interfering with appropriate responding during stressful situations such as meals.

Our objective was to describe maternal responsiveness comprehensively in mothers with eating disorder histories relative to control mothers during both mealtime and playtime through the combined use of observational, self-report, and physiologic methods. Complementary to behavioral coding of maternal-child interactions, mothers wore an ambulatory electrocardiogram (ECG) during

observations to assess vagal reactivity. Vagal reactivity is a common index of physiologic support for emotional engagement (Calkins, 1997; Hill-Soderlund et al., 2008; Mills-Koonce, et al., 2009) and response to environmental stress (Porges, 1992, 1995), yet no studies have evaluated vagal withdrawal during emotionally challenging tasks such as mealtimes in eating disorders. We hypothesized that mothers with eating disorder histories would be less responsive to child cues during feeding but not during play, and that the stress of mealtime interactions would result in increased physiologic support for engagement, manifested as increased vagal withdrawal compared with controls.

IV.C. Methods

Participants

Twenty-five women with children between the ages of 6 and 36 months were recruited from the community through university-wide emails and fliers, mother's clubs, and local daycare centers. After a phone screen, eligible participants were interviewed using the SCID-I/P (First, et al., 2002) to assess history of either AN, BN, or EDNOS. Participants must not have met threshold criteria for AN, BN, or EDNOS in the past 28 days and maintained a BMI of at least 18.5 kg/m² for three months prior to participation. Women with a history of only BED or a BMI >30 kg/m² were not included due to published differences in feeding patterns in these groups compared to women with AN, BN, and EDNOS (Birch & Fisher, 2000; Faith, et al., 2004; Reba-Harrelson, et al.).

Twenty-five control mothers with no eating disorder history were similarly recruited and screened. Eligible mothers who had not met lifetime DSM-IV criteria for AN, BN, BED, or EDNOS according to the SCID-I/P and who had a BMI between 18.5 and 30 kg/m² were matched to case women based on child age group (within 6 month age bands) and child sex.

Exclusion criteria were psychosis, including schizophrenia, bipolar I disorder, current suicidal ideation, alcohol or drug dependence in the past year, and any social service inquiries regarding child neglect. No women were excluded based on these criteria. The study was approved by the Biomedical Institutional Review Board of the University of North Carolina at Chapel Hill.

Protocol

Two members of the research team visited participants at home during a typical feeding time, interacted informally for a 15 minute warmup period, then filmed mother and child from before the meal (including food preparation) until at least two minutes after the last bite was taken. To minimize intrusiveness, videographers left the room when mother or child was stationary (e.g., child was in highchair). Before or after the meal, mothers were filmed during ten minutes of free play with their children when they were instructed to play as they typically would in their home. Mothers completed questionnaires in the week following the home visit; there was a 100% completion rate from eligible participants.

Measures

Clinical Measures

The SCID-I/P was conducted by a clinical interviewer trained to criterion to assess eating disorder history and comorbid Axis I disorders (alcohol or drug dependence, psychosis, and bipolar I disorder). After the home visit, participants completed the EDE-Q (C. G. Fairburn & Beglin, 1994) to assess eating disorder symptoms over the previous 28 days, the BDI-II (Beck, et al., 1996) to assess depressive symptoms over the past two weeks, and the BAI (Beck, et al., 1988) to assess somatic symptoms of anxiety over the past week.

Parenting Measures

Participants completed The Parenting Stress Index-Short Form (PSI/SF)(Haskett, Ahern, Ward, & Allaire, 2006), which provides three subscale scores of parental distress, parent-child dysfunctional interaction, and difficult child in addition to an overall parenting stress score. Participants respond to 36 statements regarding their sense of parenting stress on a five-point scale (1=strongly disagree to 5=strongly agree). Items were summed to create subscale scores; higher scores represent greater parenting stress. The self-efficacy subscale of the Parenting Sense of Competency Scale (PSOC)(Johnston & Mash, 1989) questionnaire assesses a parent's perceived competence, problem-solving ability, and capability in the parenting role. Participants respond to statements regarding their confidence in parenting on a 6-point scale (1=strongly disagree to 6=strongly agree). Subscale scores are

means of all items loading onto that sub scale; higher scores represent greater parenting efficacy. Mean efficacy score for mothers in a community sample was 4.41 (Gilmore & Cuskelly, 2009).

Observational Measures

The Responsiveness to Child Feeding Cues Scale (RCFCS) (Hodges, Liu, Johnson, Hughes, & Fisher, 2008) was used to code the videotaped mealtime interactions for maternal responsiveness by two trained and reliable coders blind to participant group membership. This scale provides scores of maternal responsiveness to child *hunger cues* (coded until the mother begins to prepare food), *receptiveness cues* (coded from food preparation until one minute following the first bite), and *fullness cues* (coded from one minute after the first bite until food is removed) by assessing the presence, frequency, duration, and strength of feeding cues in children in concert with the timing and appropriateness of mothers' responses to these cues. Maternal responsiveness to hunger, receptiveness, and fullness cues subscale scores range from 1 being highly unresponsive to 5 being highly responsive. Because home visits were scheduled at mealtimes, and most mothers began to prepare food immediately once filming began, child hunger cues were not captured, and maternal responsiveness to hunger cues was not evaluated in this study. Twenty percent of videos were double-coded and agreement was high. Raters were in exact agreement for 60% of scores of responsiveness to receptiveness cues and 40% of scores of responsiveness to fullness cues. Ratings were in agreement within

one point for 90% of scores of both responsiveness to receptiveness and responsiveness to fullness cues.

The ten minute free play interactions were coded for maternal sensitivity by two trained and reliable coders blind to participant group membership according to a coding system used by the National Institute of Child Health and Human Development Study of Early Child Care (Appelbaum et al., 1997). A composite maternal sensitivity score was generated as a sum of five subscales of sensitivity/responsiveness, positive regard, stimulation of cognitive development, animation, and detachment/disengagement (subtracted) all scored on a scale from 1 to 5. Twenty percent of the videos were double coded, and interrater intraclass correlation coefficients, calculated per convention with this coding scheme, ranged from 0.90 to 1.00 for the five subscales within the maternal sensitivity composite.

Vagal Withdrawal

Before filming, electrodes were placed on the mother's chest in a modified lead-II configuration and connected to an ambulatory ECG logger (BM-4, Biomedical Monitoring, Ltd) clipped to the waist. After the acclimation period, a baseline ECG recording was taken with the mother sitting in silence for two minutes. The ECG continued recording throughout meal and play times. Research staff recorded start and end times for each task (baseline, meal, and play).

A data file containing ECG recordings over the entire observation period was transferred to a computer for manual editing of artifacts that resulted from excess movement and calculation of heart inter-beat intervals (IBI) (Nevrokard Kiauta, Slovenia). Two files that required editing of more than ten percent of the data were not included in the analyses. After editing and processing the ECG files, measures of respiratory sinus arrhythmia (RSA) were extracted using Porges' method (Porges, 1995). This procedure applies an algorithm to the sequential IBI data using a moving 21-point polynomial to detrend periodicities in heart period slower than RSA. Then, a band-pass filter extracts the variance of the IBIs within the frequency band of spontaneous respiration in adults (0.12–0.40). This estimate of RSA is derived by calculating the natural log of this variance and is reported in units of $\ln(\text{ms}^2)$. RSA was calculated in 15 second epochs during the baseline recording and 30 second epochs during both meal and play periods. Vagal tone was indexed by calculating mean RSA of the epochs within each task; larger values of RSA indicate greater mean vagal tone. The difference in vagal tone from baseline provides a measure of vagal withdrawal during each task.

Statistical Analyses

All analyses were conducted with SAS version 9.2 (*SAS/STAT® Software: Version 9*, 2004). Means and standard deviations are presented for all continuous variables and percent distribution for categorical variables. Student's *t*-tests were used to evaluate differences between groups for continuous

variables. Fisher's exact test was used to evaluate differences between groups for categorical variables. Standardized effect sizes were calculated as Cohen's *d*. A repeated measures analysis of variance (ANOVA) was used to determine the effect of group (eating disorder versus control), task (mealtime versus playtime), and any group x task interaction on the outcome variable of RSA change. We used analysis of covariance (ANCOVA) to evaluate the impact of one covariate of interest at a time (our relatively small sample size precluded inclusion of multiple covariates in the same model) on the effect of group on outcome variables of maternal responsiveness to receptiveness and fullness cues, global sensitivity, and RSA change. All significance tests were two-tailed, and a *p*-value of <0.05 was considered significant. One participant was missing data for several demographic variables due to her choice not to disclose information about current weight or education. A sample size of 25 participants per group was chosen for this pilot study to have 80% power at $\alpha=0.05$ (two-tailed) to detect an effect size of 0.8 between groups, an effect size considered large (SAS®;(Cohen, 1992; *SAS/STAT® Software: Version 9*, 2004)). Given that this was a small study that was hypothesis driven but also intended to generate additional hypotheses for future, larger studies, it was not reasonable to expect that the study would have power to detect medium or small effect sizes.

IV.D. Results

The sample comprised 50 mothers of children ages 6-36 months. Of the 25 women with eating disorder histories, 13 had histories of AN (9 restricting type

and 4 binge-purge type), 13 of BN (6 non-purging type and 7 purging type), 2 of BED (in addition to another past eating disorder diagnosis), and 2 of EDNOS (both met all criteria for AN except their lowest BMI was $>18.5 \text{ kg/m}^2$). Four women had histories of two or more different eating disorder diagnoses.

Characteristics of participating mothers and their children are presented in Table 3.2. The groups did not differ significantly on their level of education, race, parity, or current BMI. The majority of mothers in both groups was white and had at least a college degree. Mothers with eating disorder histories were significantly older than controls ($p<0.01$), had higher scores on current eating disorder symptoms on the EDE-Q ($p<0.02$), and reported greater anxiety on the BAI ($p<0.01$). The groups did not differ significantly on BDI-II scores. Children of mothers with eating disorder histories did not differ significantly from children of controls in their birth weight or current weight-for-length z-score.

While mothers did not differ in terms of their parenting self-efficacy reported on the PSOC, mothers with eating disorder histories reported greater stress related to parenting on the PSI/SF subscales of parental distress and parent-child dysfunctional interaction ($p<0.03$ and $p<0.02$ respectively; Table 4.1), but groups did not differ on the difficult child subscale.

We did not detect a significant difference between groups in mothers' responsiveness to either receptiveness or fullness cues during feeding or global sensitivity during play (Table 4.2). The mean feeding responsiveness scores for both groups ranged from 3.56 - 4.56 reflecting moderate to high responsiveness. We evaluated covariates of maternal age, BDI score, and BAI score individually

along with group membership using ANCOVA, but none of these covariates had a statistically significant effect on maternal responsiveness to receptiveness cues, responsiveness to fullness cues, or global sensitivity, nor did the addition of these covariates alter the non-significance of group effect.

Mean values of RSA for mothers in both groups during baseline, mealtime, and playtime are presented in Table 4.3. Concerned that differences in baseline RSA scores could influence change scores, we conducted a post-hoc comparison of baseline RSA scores between groups and found that the difference was not statistically significant ($t(43) = -1.06, p < 0.30$). RSA change scores are presented in Figure 4.1. Positive change scores represent a decrease in RSA from baseline (vagal withdrawal). We conducted a repeated measures ANOVA with RSA change as our outcome variable comparing groups during mealtime and playtime tasks. A main effect of group emerged ($F(1,43) = 7.18, p < 0.02$). There was no significant effect for task and no significant group x task interaction. Control mothers displayed significantly greater RSA decreases (greater vagal withdrawal) during both mealtime and playtime than mothers with eating disorder histories. We evaluated covariates of maternal BMI, maternal age, and BAI score individually in addition to group using ANCOVA, but no covariate had a statistically significant effect on RSA change, nor did their inclusion alter the significance of group effect (for group effect, $p < 0.02$ in all analyses).

IV.E. Discussion

We found no differences in observed responsiveness during feeding or global maternal sensitivity between mothers with eating disorder histories and controls. However, physiologically, mothers with eating disorder histories exhibited less vagal withdrawal during both mealtime and playtime interactions with their children—suggesting decreased stress reactivity. Mothers with eating disorder histories also reported experiencing greater stress related to parenting, greater somatic symptoms of anxiety, and greater concern with their own eating, shape, and weight.

While we are not aware of any other studies directly measuring feeding responsiveness during observed mealtimes in mothers with eating disorder histories, several studies have found that mothers with eating disorders report more controlling and less responsive feeding styles via self-report instruments (Agras, et al., 1999; Duke, et al., 2004; Honjo, 1996; S. E. Mazzeo, et al., 2005; Reba-Harrelson, et al.) and express concerns about feeding the appropriate quantity and quality of foods to their children in qualitative interviews (S. E. Mazzeo, et al., 2005). Yet in practice, at least in this sample, mothers with eating disorder histories are moderately to highly responsive to their children's receptiveness and fullness cues.

Clinically relevant differences in vagal reactivity have been reported in individuals with eating disorders, with some aspects of vagal abnormalities persisting despite weight restoration and recovery (Lachish, et al., 2009; Messerli-Burgy, et al., 2010; Murialdo, et al., 2007). Results of our unique

evaluation of vagal reactivity during maternal-child interactions support past studies demonstrating decreased vagal reactivity in this population suggestive of increased stress vulnerability (Messerli-Burgy, et al., 2010; Murialdo, et al., 2007). Contrary to our hypothesis, mothers with eating disorder histories exhibited no vagal withdrawal in response to interactions with their children. We predicted that they would perceive mealtime interactions as stressful, thus requiring vagal withdrawal to physiologically confront the challenge and support social engagement; however, the lower level of vagal tone observed at baseline in these mothers suggests they may have a reduced physiologic capacity to respond to environmental stressors.

Our cases included recovered mothers only, while past observations of controlling feeding (Agras, et al., 1999; Honjo, 1996; Reba-Harrelson, et al.) or affective differences during mealtimes (Stein, et al., 1994; Waugh & Bulik, 1999) included either all current or both current and past sufferers. Interestingly, our study showed that while mothers with eating disorder histories may not differ from controls in responsiveness to children's cues, they still reported greater anxiety and parenting stress, and physiologically exhibited less vagal withdrawal during interactions with their children. Thus, these mothers, through their recovery from an eating disorder, may have learned to manage their underlying physiology that may predispose them to greater anxiety and stress susceptibility. In the observational setting, they were able to respond to their children's cues and exhibit sensitive parenting behavior. However, this physiologic difference in stress vulnerability could place them at greater risk for physical and

psychological stress-related problems (and eating disorder relapse) as their children grow older and they face additional parenting challenges.

Our study has limitations. First, as a case-control study with a relatively small sample size, we were unable to apply more complex statistical modeling to evaluate relationships across observational, self-report, and physiologic modalities. Second, as power to detect smaller effect sizes was limited, failure to find a significant effect does not imply the effect does not exist. Third, while direct observation during maternal-child interactions is a strength, it is also subject to participant reactivity and social desirability bias. Fourth, we were unable to evaluate maternal responsiveness to hunger cues which would provide valuable information about decisions to initiate feeding. Finally, our sample was largely white and educated, so findings may not be widely generalizable.

Our study is the first to evaluate responsive feeding through direct observation in mothers with eating disorder histories, and we found no differences in these mothers compared with controls in responsiveness to child feeding cues or overall maternal sensitivity. However, physiologically, mothers with eating disorder histories exhibited decreased stress reactivity and reported greater anxiety and parenting stress than controls. Counseling of mothers with eating disorder histories should include general stress management techniques and self-care.

Table 4.1. Mothers' Self-Reported Parenting Stress and Parenting Self-Efficacy

	Mothers with Histories of Eating Disorders	Control Mothers		
	Mean (SD)	Mean (SD)	Test Statistic and <i>p</i> -value	Cohen's <i>d</i>
PSI/SF Total Stress	70.52 (15.97)	61.75 (12.27)	$t(47) = 2.15, p < 0.04^1$	0.63
Parental Distress	26.40 (7.82)	22.00 (5.95)	$t(48) = 2.24, p < 0.03^1$	0.65
Parent-Child Dysfunctional Interaction	20.12 (5.20)	16.84 (4.18)	$t(48) = 2.45, p < 0.02^1$	0.71
Difficult Child	24.00 (6.41)	22.29 (5.21)	$t(47) = 1.02, p < 0.31$	0.30
PSOC Self-Efficacy	4.55 (0.96)	4.66 (0.76)	$t(48) = -0.44, p < 0.66$	0.13
PSI/SF–Parenting Stress Index-Short Form; higher scores represent greater stress, PSOC–Parenting Sense of Competency Scale; higher scores represent greater self-efficacy				
¹ $p < 0.05$				

Table 4.2. Maternal Responsiveness During Feeding and Sensitivity During Play

	Mothers with Histories of Eating Disorders	Control Mothers		
	Mean (SD)	Mean (SD)	Test Statistic and <i>p</i> -value	Cohen's <i>d</i>
<i>Behavioral Coding of Feeding</i>				
Responsiveness to receptiveness cues	4.56 (0.96)	4.40 (0.91)	$t(48) = 0.60, p < 0.55$	0.17
Responsiveness to fullness cues	3.56 (0.96)	3.84 (1.07)	$t(48) = -0.97, p < 0.33$	0.28
<i>Behavioral Coding of Play</i>				
Global Sensitivity	9.52 (4.24)	10.00 (3.55)	$t(48) = -0.43, p < 0.67$	0.12
Responsiveness to feeding cues scale scores range from 1 (unresponsive) to 5 (highly responsive); Global sensitivity composite scores range from -1 (low sensitivity) to 19 (highly sensitive)				

Table 4.3. Mean Vagal Tone During Each Task

	Mothers with Histories of Eating Disorders	Control Mothers
	Mean (SD)	Mean (SD)
RSA		
Baseline	6.04 (1.32)	6.47 (1.42)
Mealtime	6.08 (1.05)	5.80 (1.16)
Playtime	6.06 (1.12)	5.86 (1.20)
RSA-Respiratory sinus arrhythmia		

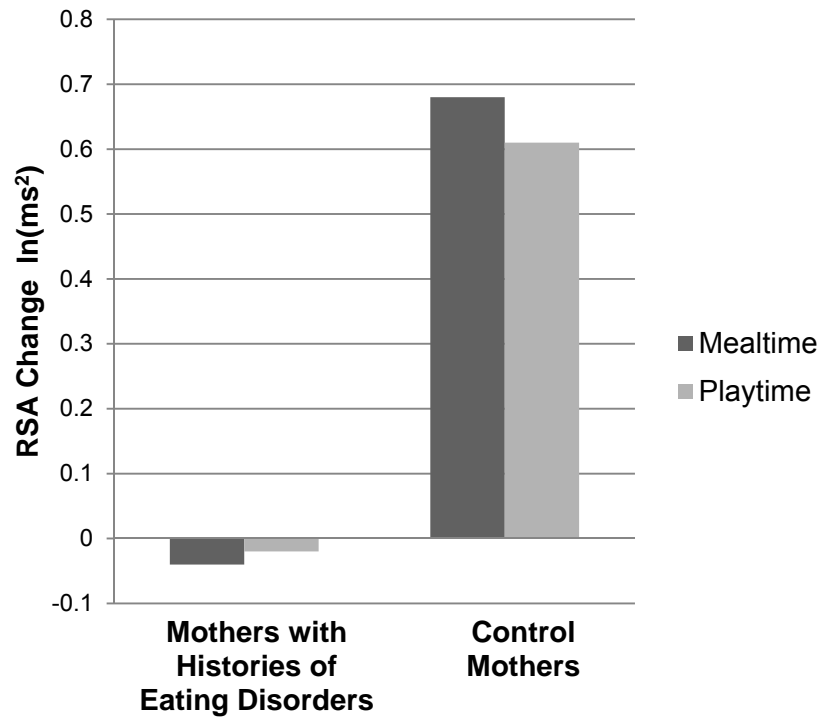


Figure 4.1. RSA change scores from baseline during both mealtime and playtime maternal-child interactions are presented. Positive values for RSA change indicate a decrease in RSA from baseline (vagal withdrawal). $F(1,43)=7.18$, $p<0.02$ for effect of group on RSA change; effect of task and group x task interaction were not statistically significant.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

V.A. Summary of Findings

In an effort to provide a comprehensive description of maternal responsiveness in mothers with histories of eating disorders, we evaluated 1) self-reported maternal responsiveness, 2) observed maternal responsiveness, and 3) physiologic maternal responsiveness in mothers with histories of eating disorders compared with controls. Results of the three research aims are summarized below.

In the first aim, presented in Chapters III and IV, we evaluated mothers' self-reported feeding styles and diet choices, parenting self-efficacy, and parenting stress. We found no difference between mothers with histories of eating disorders and control mothers on scores for laissez-faire, pressuring, indulgent, or responsive feeding styles; both groups scored highest on the responsive feeding style subscale. Mothers with histories of eating disorders scored significantly lower than control mothers on the restrictive feeding subscale, contrary to previous studies reporting more restrictive feeding styles in mothers with eating disorders. In terms of diet choices, no significant differences were found between groups in the percentage of mothers who breastfed, or on duration of breastfeeding, age at solid food introduction, number of meals or

snacks per day, daily servings of fruit and vegetables, or daily servings of protein foods, but mothers with histories of eating disorders were more likely to report taking some special approach to feeding than control mothers. The most common special approaches reported were limiting processed foods and serving organic foods only. Mothers with histories of eating disorders did not differ from control mothers in terms of parenting self-efficacy; however, they did score higher on a measure of parenting stress. This study is the first to report high scores of responsive feeding and parenting self-efficacy in mothers with histories of eating disorders. Additionally, no other studies have evaluated special approaches regarding monitoring of diet quality in mothers with eating disorders, an area we feel requires greater research.

In the second aim, presented in Chapter IV, we evaluated maternal responsiveness through videotaping and behavioral coding of both a free play and typical feeding episode in the home setting. Using the RCFCS coding scheme, we found no difference in maternal responsiveness to child receptiveness cues or fullness cues during feeding in mothers with histories of eating disorders compared with control mothers. Mean scores of maternal responsiveness during feeding in both groups were in the moderately responsive to highly responsive range. After behavioral coding of the free play interactions, we found no difference between groups in global maternal sensitivity. Our findings during free play are contrary to findings in previous studies of mothers with active eating disorders reporting lower levels of facilitation and greater intrusiveness during play. This was the first study to measure responsiveness

during feeding in mothers with histories of eating disorders through direct observation in the home setting. Our findings indicate that mothers with histories of eating disorders are capable of responding appropriately to their children's cues during both feeding and free play interactions.

In the third aim, presented in Chapter IV, we evaluated mothers' physiologic engagement during interactions with their children through the measurement of vagal reactivity during both feeding and free play episodes. We found that mothers in the control group displayed significantly greater RSA decreases (greater vagal withdrawal) during both mealtime and playtime tasks than mothers with histories of eating disorders, suggesting that control mothers were experiencing greater physiologic support for engagement with their children. Our findings support previous studies demonstrating decreased vagal reactivity and increased vulnerability to stress in women with histories of eating disorders. However, this is the first study to evaluate vagal reactivity in women with histories of eating disorders during maternal-child interactions.

In sum, mothers with histories of eating disorders are moderately to highly responsive to their children's cues during feeding and report a high level of self-confidence in their parenting abilities. Yet, they also experience greater anxiety and parenting stress than control mothers and exhibit increased physiologic vulnerability to stress. Thus, while past studies of mothers with eating disorders have largely focused on the evaluation of feeding behaviors, it appears that management of parenting anxiety and stress could represent a challenge for these mothers. Based on our findings, future intervention efforts for mothers with

histories of eating disorders should include general stress management techniques and emphasize the importance of self-care. We provide more detailed recommendations based on these results in the following section.

V.B. Significance and Recommendations

Our findings have important implications for future interventions for mothers with histories of eating disorders. While previous studies have found that mothers with eating disorders are more likely to engage in controlling feeding practices than mothers without eating disorders, we found that mothers with histories of eating disorders were highly responsive during feeding based on both self-report and observation. One major difference in this study compared with past studies was that our sample of mothers with eating disorders was comprised entirely of mothers who no longer met full diagnostic criteria for an eating disorder, while past studies have included either all actively ill mothers or a mix of recovered and actively ill mothers. Strikingly, despite the recovered status of our sample, we found that mothers with histories of eating disorders still reported greater anxiety, parenting stress, and a physiologically blunted stress response during interactions with their children.

These findings indicate that there may be differences, both physiologically and psychologically, in mothers with histories of eating disorders which could increase their vulnerability to stress. Yet, despite reporting increased parenting stress and displaying a lack of physiologic support for engagement, mothers with histories of eating disorders did not differ significantly from control mothers in

their ability to respond appropriately to their children's cues during mealtime and playtime. It may be that these mothers who are in recovery from an eating disorder have developed appropriate strategies to deal with their increased vulnerability to stress. However, our findings highlight the importance of long-term screening for unhealthy eating behaviors, anxiety, and symptoms of stress in mothers with histories of eating disorders. Despite their recovered status, these women still reported greater concern with their shape and weight, greater anxiety, and greater stress than control mothers. These lingering symptoms and the apparent sustained physiologic vulnerability to stress underscore the importance of practitioners (primary care physicians, psychiatrists, psychologists, dietitians, obstetric-gynecologists) being mindful of these tendencies and remaining vigilant for re-emergent symptoms of unhealthy eating behaviors, anxiety, and symptoms of stress to prevent relapse of the eating disorder or the emergence of other unhealthy coping behaviors.

Future intervention studies for mothers with histories of eating disorders should teach effective stress management techniques and reinforce healthy strategies already in place to help prevent sequelae of chronic stress in these mothers. This will be particularly important as children grow older, siblings are born, and new and different parenting challenges emerge.

Regarding feeding specifically, we found no differences in a range of self-reported and observed feeding behaviors between mothers with histories of eating disorders and control mothers in our sample of mothers of children ages 6-36 months, but it will be important to ensure that responsive feeding behaviors

in mothers with histories of eating disorders continue as children grow older and their desire for autonomy during feeding increases. We did find that mothers with histories of eating disorders are more likely to report taking a special approach to feeding their child, such as feeding only low processed foods or organic foods. These special approaches could be considered controlling feeding behavior with respect to diet quality, but future investigations should determine whether these feeding practices are implemented covertly to promote healthier diets without children perceiving dietary restriction or if the special approaches represent more rigid dietary rules that children are overtly encouraged or forced to follow.

While we do not yet understand the implications of these special feeding practices, past studies have shown that a covert rather than overt monitoring of child diet quality is critical for fostering a healthy relationship with food in later childhood (Birch & Fisher, 1998). It will be important in future interventions for mothers with histories of eating disorders to teach mothers how to monitor their children's diet quality in such a way that the child is not aware that restrictions are being placed on the quality of food offered. Additionally, mothers should be encouraged to be flexible with regards to child diet, particularly as children grow older, ensuring that these special approaches do not become rigid dietary rules.

Overall, these findings indicate that a major focus of future interventions for mothers with histories of eating disorders should be stress management and self-care to prevent chronic symptoms of stress and potential relapse of eating disorders. Emphasis should also be placed on the maintenance of healthy strategies to deal with stress as children grow older. Maternal feeding behavior of

mothers with histories of eating disorders may not be measurably different from control mothers when children are at this young age, but increased stress and anxiety combined with a sustained focus on weight and shape could result in additional challenges for feeding and modeling of healthy eating behaviors over time.

V.C. Directions for Future Research

The findings from this project highlight several areas for future research:

- 1) In Aims 1 and 2 of this project, we did not detect a difference in self-reported or observed maternal responsiveness during feeding between mothers with histories of eating disorders and control mothers. However, this project included only mothers of children ages 6-36 months, and responsiveness was measured at a single time point. In addition, this study was limited by the size of the sample, and we lacked the power to detect small or moderate effect sizes. Future study is needed to determine if responsiveness during feeding in mothers with histories of eating disorders changes across time as children grow older. A larger longitudinal study of the feeding environment in mothers with histories of eating disorders should be conducted with the power to detect small to moderate effect sizes to determine if there are any subtle differences in feeding behaviors of mothers with histories of eating disorders compared with control mothers as their children develop from infancy through

adolescence (across the time period when maternal influence on eating behavior is strongest).

- 2) In Aim 1 of this project, we found that mothers with histories of eating disorders were more likely to report taking some special approach to feeding such as limiting the amount of processed foods in their children's diets. Although these special approaches could be considered a type of restriction of diet quality, we did not find that mothers with histories of eating disorders were more restrictive of diet quality or quantity than control mothers using more conventional measures of dietary restriction through the IFSQ. In fact, mothers with histories of eating disorders reported being less restrictive than control mothers using this measure. These disparate findings support further study of diet monitoring practices in mothers with histories of eating disorders. Mothers with histories of eating disorders may exhibit restrictive behaviors that are different than those addressed on the IFSQ (limiting junk food, high fat foods, sweets, or soda/sugary drinks). Qualitative interviews with mothers with histories of eating disorders regarding special approaches taken to monitor diet quality (low processed foods, organic foods only, natural foods only, no added sugar, etc.) would be informative for future development of questionnaires assessing feeding behaviors in this group. In addition, qualitative interviews could help us to better understand whether these special approaches to feeding are typically implemented in a covert or overt fashion. This is an area that will require much research in the future,

- perhaps integrated into longitudinal studies of this group, to determine whether the increased attention to child feeding results in better self-regulation of eating and healthier diets or more rigid dietary rules that are perceived by children as restrictive.
- 3) In Aim 1, we evaluated self-efficacy and stress regarding parenting in general and found that mothers with histories of eating disorders did not significantly differ from control mothers in terms of parenting self-efficacy, but they did report increased parenting stress. While these findings give us a broad indication of mothers' perception of the parenting experience, we did not measure self-efficacy or stress regarding the feeding domain specifically. It will be important in future studies to measure domain-specific self-efficacy and stress in mothers with histories of eating disorders compared to control mothers to determine if there are certain aspects of parenting (feeding, modeling healthy eating behaviors, food preparation, etc.) for which mothers have less confidence in their abilities. Understanding differences in self-efficacy as well as stress in mothers with histories of eating disorders compared with controls across various domains of parenting would allow us to target specific areas of concern in future interventions for mothers with histories of eating disorders.
- 4) In our exploratory Aim 3, we found that mothers with histories of eating disorders displayed decreased vagal withdrawal compared with control mothers during interactions with their children. Future studies should evaluate vagal reactivity in women with histories of eating disorders in

response to other emotionally challenging situations not involving children (e.g., mealtimes, interactions with partner, therapy sessions) compared with controls to better understand the physiologic stress response capacity in these women. In addition, comparison of vagal response during maternal-child interactions in mothers with current versus past eating disorder diagnoses would provide additional insight into the effect of acute unhealthy eating behaviors on vagal reactivity. Future studies should also evaluate vagal reactivity of the children of mothers with histories of eating disorders during maternal-child interactions to determine if this decreased physiologic capacity to respond to challenging environmental stimuli could be familial and represent a vulnerability marker for later anxiety disorders or disordered eating.

In summary, this project has provided a comprehensive view of maternal responsiveness in mothers with histories of eating disorders across self-report, observational, and physiologic domains. We did not detect a difference in self-reported or observed responsiveness during feeding of infants and toddlers between mothers with histories of eating disorders and control mothers, but future studies should include larger more diverse samples and should continue to evaluate responsive feeding behavior as children grow older and the feeding environment becomes more complex. Given the increasing attention to natural and organic food consumption in our culture, future work is needed to better understand the implementation of child diets restricted to low processed foods,

organic foods only, or other popular diet trends reported by many mothers in this study and determine how these feeding practices could influence future child eating. Lastly, while we did not detect a difference in observed maternal behavior between mothers with histories of eating disorders and control mothers, we did find that mothers with histories of eating disorders display a blunted physiologic response to stress and report experiencing greater stress related to parenting than controls. Thus, greater attention should be given to the influence of stress on parenting in general and the feeding environment specifically for mothers with histories of eating disorders in future investigations.

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